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PENSOFT

Occurrence of the rare and Endangered Ornate Eagle Ray, *Aetomylaeus vespertilio* (Bleeker, 1852) (Chondrichthyes, Myliobatidae), at a remote marine protected area in the Philippines

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Abstract

We report the occurrence of the rare and Endangered *Aetomylaeus vespertilio* (Bleeker, 1852) at the remote archipelago of Cagayancillo, Palawan in the Sulu Sea, Philippines. Only 1 previous report of the species exists from the country, a juvenile specimen in the Pasil market, Cebu City in 2000. During an in-water shark and ray survey at Cagayancillo Island in April 2017, a female individual *A. vespertilio* with a disc width of approximately 200 cm, and a total length of approximately 400 cm was encountered along the reef's edge at a depth of 12 m. This species was confirmed by its characteristic dorsal pattern of narrow stripes anteriorly and reticulated spots posteriorly. We confirm the occurrence of this rare and poorly understood species in the Sulu Sea and extend the current known range farther west than previously known.

Keywords

Sulu Sea; archipelagic; elusive; conservation; live encounter; myliobatid

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Introduction

Aetomylaeus vespertilio (Bleeker, 1852) is a rare species of eagle ray belonging to the family Myliobatidae (White and Naylor 2016). The largest species in its genus, and a relatively large eagle ray, it grows to at least 300 cm maximum disc width (DW). It has a long whip-like tail, which extends the total length (TL) to 3 times the DW (Last et al. 2016). It has a long and rounded rostral lobe with a small mouth.

The currently known range of *A. vespertilio* is patchy, with reports from the Indo-West Pacific including Mozambique, the Red Sea, India, the Maldives, Indonesia, Philippines, China, Malaysia, Taiwan, and northern Australia (White and Kyne 2016). Its diet is unknown, but this fish likely preys on bottom-dwelling, hard-shelled invertebrates, as do other eagle rays (Schluessel et al. 2011). Its habitat use is also unknown but this is likely to include coastal habitats, such as coral reefs and muddy bays (Last et al. 2016). *Aetomylaeus vespertilio*

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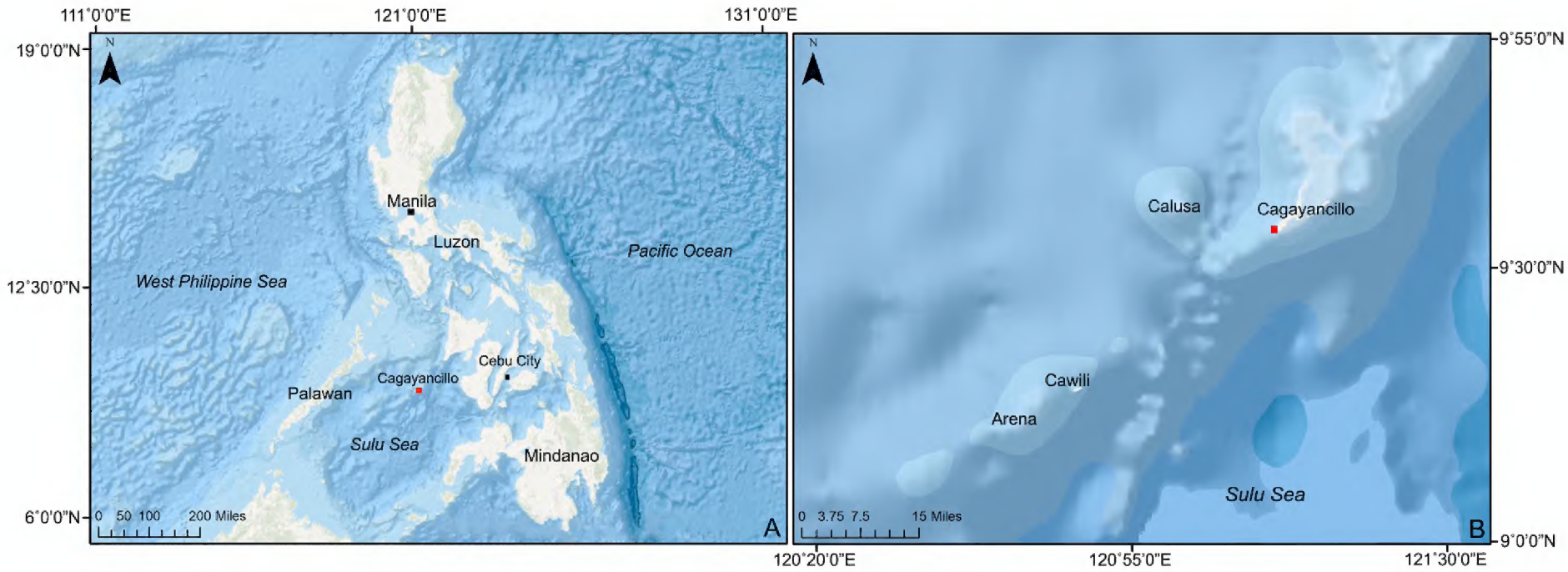

Figure 1. Map of the Philippines (**A**) and Cagayancillo Islands therein (**B**). The "airport strip" dive site is located in the southwest tip of the island, indicated by the red square.

is Endangered on the IUCN Red List due to suspected population declines of over 50% in the last 3 generations (45 years), and continued fishing pressure throughout its range (White and Kyne 2016).

At least one-quarter of all chondrichthyans are threatened with extinction, primarily due to targeted fisheries and incidental catches, although habitat loss, persecution, and climate change are threats (Dulvy et al. 2014). Eagle rays are highly susceptible to numerous fisheries (e.g. trawls, gillnets), and over 50% of myliobatid species are listed as Vulnerable or Endangered on the IUCN Red List (McClenachan et al. 2012). Eagle rays were landed in considerable numbers into the late 1990s in Malaysia and Thailand (Compagno and Last 1999) and likely throughout their range. As a result, they have been mostly extirpated from the Gulf of Thailand and possibly across a larger portion of their range (White 2006).

Large marine protected areas (MPAs) have the potential of mitigating some of the current threats to marine biodiversity, although the effectiveness of these areas for chondrichthyans is not yet fully understood (Davidson and Dulvy 2017). For example, the White-spotted Eagle Ray, *Aetobatus narinari* (Euphrasén, 1790), displays strong site affinity and localized movements (Ajemian and Powers 2014, Flowers et al. 2017), and therefore, spatially-focused management would protect this species during at least part of its life history. However, this would likely be incomplete, as it has been shown in other elasmobranch species, like the reef-associated Grey Reef Shark, *Carcharhinus amblyrhynchos* (Bleeker, 1856) (White et al. 2017). A multidisciplinary approach to chondrichthyan conservation might be optimal, by means of having spatial, temporal, size, and gear restrictions in artisanal and commercial fisheries (Dulvy 2013), depending on the level of engagement and implementation possible. Such features can complement the 5 key features of Edgar et al. (2014) for MPA effectiveness, namely that there be no take within the MPA, that this be well enforced, that the MPA is old (>10 years), that it is large (>100 km^2), and that it is isolated by deep water or sand.

In the Philippines, there is a single record of *A. vespertilio* from the Pasil fish market in Cebu City landed on 12 April 2000; it is a juvenile male specimen measuring 53.2 cm DW and 153.7 cm TL (Joe Pres A. Gaudiano, JPAG, collection no. 324, Silliman University; Compagno et al. 2005, Alava et al. 2014). Here, we report the first live encounter of *A. vespertilio* in the Philippines at the remote archipelago of Cagayancillo in the Sulu Sea, and discuss the implications for the conservation and management of this species.

Methods

Study site. Cagayancillo is an archipelagic municipality in the northeastern Sulu Sea, approximately 270 km east of Puerto Princesa City, Palawan, Philippines (Fig. 1). The municipality comprises 31 islands and covers a land area of 26.4 km^2. On these islands live over 7000 people, whose main source of livelihood is fishing and seaweed farming (Dygico 2016). Sustainable practices have been encouraged, and ongoing work by WWF-Philippines is yielding benefits for the local communities (Dygico 2016). The main island of Cagayancillo extends about 12 km southwest to northeast with seagrass, mangrove, shallow and deep reef habitats extending around it. The island is near deep-water areas that exceed 4000 m and reach temperatures of <10 °C (Gordon et al. 2011). The municipality was recently declared the largest MPA in the Philippines, spanning 1 million ha. The MPA comprises various multiple-use zones, with strict no-take zones in place, whilst other areas are being studied for regulated resource use, such as gear restrictions to hook and line and closure during spawning season of certain species.

Haphazard scuba-based surveys were employed across the islands of Calusa, Arena, Cawili, and Cagayancillo (Fig. 1). Surveys were conducted within recreational scuba diving limits to 40 m to document species of sharks and rays present within the municipal waters of Cagayancillo. These surveys did not quantify abundance of individuals, and hence, the approach was haphazard.

Figure 2. *Aetomylaeus vespertilio* free-swimming along the reef at 12 m.

Figure 3. *Aetomylaeus vespertilio* can be identified through its unique dorsal pattern of thin stripes anteriorly, followed by reticulated spots posteriorly.

Video, photographic, and written notes were taken during surveys. We estimated the size of animals when possible. For our identifications of sharks and rays, we consulted the works of Ebert et al. (2013), Alava et al. (2014), and Last et al. (2016).

Results

New record. Whilst surveying the "airport strip" dive site on Cagayancillo Island (09°34′15″ N, 121°10′47″ E) on 25 April 2017, we encountered a female ornate eagle ray *A. vespertilio* individual, measuring an estimated 200 cm DW and 400 cm TL (Figs 2, 3; Supplementary Movie S1). The species was confirmed by its unique dorsal pattern of anterior dark stripes and posterior reticulated spots, and compared against Last et al. (2016) and Alava et al. (2014) (Fig. 2, 3). Its sex was confirmed by the absence of claspers on its pelvic fins. The ray was observed slowly swimming along the reef's edge at 12 m, approximately 1 m from the substrate. The ray was associated with 5 juvenile Golden Trevally, *Gnathanodon speciosus* (Forsskål, 1775), and 1 suckerfish, likely the Common Remora, *Remora remora* (Linnaeus, 1758) or the Live Sharksucker, *Echeneis naucrates* Linnaeus, 1758 (Fig. 4). The ray was observed defecating, possibly in response to diver proximity and strobe use, after which it quickly accelerated and dove out of sight (Fig. 4).

Discussion

Though brief, this represents the first report of a live encounter with *A. vespertilio* in the Philippines (Supplementary Movie S1). Online searches in social media platforms (i.e., Facebook, Twitter, Instagram, and Google) found no reported encounters with this elusive species. Only 1 previous record of this species exists

Figure 4. *Aetomylaeus vespertilio* defecates before fleeing, possibly in response to diver proximity and strobe use. Note the associated fauna of juvenile Golden Trevally and a suckerfish. Photo credit Jun V. Lao.

in the country (Compagno et al. 2005), which is from a fish market in the Visayas region of the Philippines, but it is uncertain where it was caught. We can confirm the presence of *A. vespertilio* in Cagayancillo, Sulu Sea, and extend the known range of this species westward in the Philippines. Although the size of this species at maturity is unknown (White 2006), this individual was near the maximum reported size for the species (240 cm DW; White 2006), and therefore, possibly mature. The associated fauna observed, namely the suckerfish and Golden Trevally, are also commonly associated with other marine megafauna (e.g. Whale Shark, *Rhincodon typus* A. Smith, 1828; Rowat and Brooks 2012). The occurrence of this rare myliobatid in a remote MPA is notable and highlights the need to further investigate the ecology and movement patterns of threatened, little-known species and the role of MPAs for their conservation.

Aetomylaeus vespertilio was encountered in what was recently declared (September 2016) the largest MPA in the Philippines, covering an estimated 1 million ha. Eagle rays are mostly reef-associated, coastal batoids, and therefore, restricting gillnets and trawlers throughout the range of these species could benefit their conservation (Compagno and Last 1999, McClenachan et al. 2012). During in-water surveys at Cagayancillo islands, spotted eagle rays (*Aetobatus* spp.) were encountered on every dive (GA, pers. obs.), which further highlights the occurrence of eagle rays in this area. Interestingly, the ray defecated before speeding up and diving, a response by animals to divers or snorkelers that has been previously reported in other elasmobranch species (e.g. Whale Sharks; Araujo et al. 2017); this warrants attention when developing sustainable tourism practices (e.g. Lawrence et al. 2016).

The municipality of Cagayancillo encompasses Tubbataha Reefs Natural Park (TRNP) approximately 150 km southwest of Cagayancillo Island. TRNP is possibly the best example of a well-managed MPA in the Philippines (Aquino et al. 2015, Dygico 2016). This MPA is a strictly no-take zone that covers roughly 100,000 ha and has year-round monitoring and on-site rangers. It hosts one of the highest densities in the world of reef-associated sharks reported to date (Authors, unpub. data). TRNP is an important habitat for elasmobranchs, and understanding its effectiveness for different species can help model other MPAs in the country, like Cagayancillo. Although sightings of *Aetobatus* spp. have been reported by citizen scientists (Tubbataha Management Office, unpub. data) using baited remote underwater video cameras and underwater visual surveys (Authors, unpub. data), no study has focused on their connectivity between TRNP and Cagayancillo, or their association to these remote islands and atolls. TRNP follows all 5 key MPA features suggested by Edgar et al. (2014), which is reflected in the abundance and biodiversity of shark species (Authors, unpub. data), and likely is instrumental in the conservation of myliobatid rays.

The effectiveness of spatially focused MPAs for conserving elasmobranchs is not yet fully understood, though some protection is evident. It appears that although it is important to create refuges for elasmobranchs as they are highly susceptible to fishing pressure (Dulvy et al. 2014), for their effective management, a combination of spatial restrictions with other conservation strategies such as restricted gear, catch quotas, and temporal limits might be necessary (Maxwell et al. 2015). Given the lack of understanding of the ecology and movement patterns of *A. vespertilio*, their Endangered status, and their susceptibility to trawls and gillnets (McClenachan et al. 2012), efforts to mitigate such threats, at least locally, should be pursued. Further research on *A. vespertilio* and the importance of Cagayancillo should be prioritized, particularly in light of possibly mature individuals there. This could lead to more efficient zoning and management of this newly established MPA and which may be critical for elasmobranch conservation as a whole.

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Supplementary Materials

Movie S1. Encounter with *Aetomylaeus vespertilio* at Cagayancillo Island, Sulu Sea, Philippines.